ments, the landmark point may still be estimated based on the grid representation of the face. For example, a neural network (or other processor) may predict where the landmark point may be based on other data. For example, the neural network can estimate the location of the nose relative to the estimated location of the corners of the eyes.

[0053] FIG. **8** depicts a representation of an example of an embodiment of estimated centers of gravity **306** with respect to the grid representation of face **300**. FIG. **8** depicts the example with 7 landmark points from 7 landmark heat maps. Centers of gravity **306** may be estimates of the landmark points from each landmark heat map **206**. From centers of gravity **306** (e.g., the landmark points), the four landmarks represented by these landmark points may be identified. For example, in the depicted embodiment, the mouth can be identified based on the estimated location of the two mouth corners and the right eye can be identified by the estimated locations of the two corners of the right eye. It is to be understood, however, that other landmarks may also be considered (e.g., ears, chin, etc.).

[0054] In certain embodiments, shapes **308** may be used to represent the landmarks. Shapes **308**A may represent the eyes while shape **308**B represents the nose and shape **308**C represents the mouth. In some embodiments, shapes **308**A are lines between the respective centers of gravity **306** for the eyes (i.e., corners of eyes), shape **308**B is a circle centered on center of gravity **306** for the nose (i.e., tip of nose), and shape **308**C is a line between the centers of gravity representing the corners of the mouth. In certain embodiments, shapes **308**A and shapes **308**C are represented by other shapes between centers of gravity **306** representing the corners of the eyes and the mouth with the shapes including the corners. Shape **308**B may be a triangle or other representative shape drawn around center of gravity **306** for the nose landmark. In some embodiments, the shape of shapes **308**A, **308**B, **308**C are based on intensity spread around centers of gravity **306**. Any heuristic may be used to determine the shape of shapes **308**A, **308**B, **308**C based on the intensity spread.

[0055] Once the locations of the landmarks are identified in **210**, the identified landmark locations are combined with occlusion heat map **208** to assess occlusion scores for the landmarks in **212**. Combining the identified landmark locations and occlusion heat map **208** may include bringing together or fusing the locations and the occlusion map. For example, the shapes used to identify the landmark locations may be mapped onto occlusion map **208**. As an example, FIG. **9** depicts occlusion heat map **208** (from FIG. **7**) overlaid onto the map of landmark shapes (from FIG. **8**).

[0056] Once the identified landmark locations are combined with occlusion heat map **208**, as depicted in the example of FIG. **9**, an occlusion score may be assessed for each of the landmark shapes (e.g., for the eyes, the nose, and the mouth). The occlusion score may be a measurement or value that represents an estimation of how much the landmark shape is occluded. For example, the occlusion score may be a scaled value of occlusion (e.g., a value between 0 and 1 with 0 not being occluded and 1 being completely occluded) or a percentage occlusion value (e.g., from 0% occlusion to 100% occlusion). For the example shown in FIG. **9**, a percentage occlusion score for the eyes and nose may be 0% as neither landmark shape has any occlusion while a percentage occlusion score for the mouth may be about 40% as a portion of the mouth is occluded.

[0057] After the occlusion scores for the landmarks are assessed in **212**, an operation of device **100** may be controlled based on the assessed occlusion scores in **214**. In some embodiments, the assessed occlusion scores are used to control operation of device **100** during an enrollment process (e.g., an image enrollment process) or a template update process. For example, the image captured to generate image input **202** may be discarded (e.g., rejected) from the enrollment process (or the template update process) if one or more of the assessed occlusion scores (or a composite occlusion score) are above a selected occlusion threshold. Discarding or rejecting the captured image may include, for example, removing or deleting the captured image from device **100** (e.g., removing or deleting the captured image from the memory of the device) or preventing the captured image to be used for facial recognition, enrollment, or other applications of the captured image on the device. The selected occlusion threshold may be a maximum level of occlusion selected to ensure that the face of the user has levels of occlusion that are sufficiently low to allow additional processing of the image to be effective. For example, only allowing images with levels of occlusion below the maximum level of occlusion to be used during the enrollment process (or the template update process) may reduce the false acceptance rate during a facial recognition authentication process using the templates generated during the enrollment process (or the template update process).

[0058] In some embodiments, the assessed occlusion scores are used to control operation of device **100** during a facial recognition authentication process. For example, unlocking device **100** (or another function controlled by the facial recognition authentication process) may be prevented from occurring if one or more of the assessed occlusion scores (or a composite occlusion score) are above a selected occlusion threshold. In certain embodiments, the captured image is discarded (e.g., rejected) by the facial recognition authentication process when unlocking the device is prevented based on the assessed occlusion scores. Discarding or rejecting the captured image may include, for example, removing or deleting the captured image from device **100** (e.g., removing or deleting the captured image from the memory of the device). In some embodiments, the threshold for occlusion in the facial recognition authentication process is lower than the threshold for occlusion in the enrollment process or the template update process. Having a lower threshold for occlusion in the facial recognition authentication process may provide a higher acceptance rate and a more beneficial experience for the user.

[0059] In some embodiments, if occlusion of a landmark is above a selected level during the facial recognition authentication process, the facial recognition authentication process may ignore the occluded landmark for a matching decision between the user in the captured image and an authorized user. In some embodiments, the facial recognition authentication process may increase the thresholds for matching of other landmarks when the occluded landmark is ignored. The effectiveness of the facial recognition authentication process may be increased by allowing the process to ignore the occluded landmark and/or focus on landmarks that are not occluded when authenticating the user.

[0060] In some embodiments, if a landmark is occluded above a selected occlusion threshold, device **100** may notify the user in the captured image that the landmark is occluded. For example, the user may be notified during an enrollment